

REMARKS

Prior to entry of this amendment, claims 1, 2 and 4-18 are pending in the subject application, of which claims 13-18 are withdrawn from consideration, and claims 1 and 13 are independent. By the instant amendment, claims 1 and 4 are amended, and claims 19 and 20 are added.

Claims 1, 2 and 4-18 are presented to the Examiner for further prosecution on the merits.

A. Introduction

In the outstanding Office action:

1. claim 4 was objected to as being dependent on a canceled claim;
2. claims 1, 6, 7 and 9-12 were rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 2 and 4-6 of U.S. Patent No. 6,886,919 to Lim et al. (hereinafter referred to as "the Lim et al. reference");
3. claims 2-5 and 8 were rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 2 and 4-6 of the Lim et al. reference in view of U.S. Patent No. 5,841,452 to Silverbrook (hereinafter referred to as "the Silverbrook reference") and U.S. Patent No. 5,710,070 to Chan (hereinafter referred to as "the Chan reference");
4. claim 4 was rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 2 and 4-6 of the Lim reference in view of the Chan reference;
5. claims 1, 2, 5, 6 and 8 were rejected under 35 U.S.C. § 102(b) as being anticipated by the Silverbrook reference;
6. claim 4 was rejected under 35 U.S.C. § 103(a) as being unpatentable over the Silverbrook reference in view of the Chan reference; and
7. claim 7 was rejected under 35 U.S.C. § 103(a) as being unpatentable over the Silverbrook reference in view of U.S. Patent Publication No. 2002/0008738 to Lee et al. (hereinafter referred to as "the Lee et al. reference").

B. Objection to Claim 4

In the outstanding Office action, claim 4 was objected to as being dependent on a canceled claim. By the instant amendment, claim 4 is amended to depend directly from

independent claim 1. Accordingly, applicants respectfully request that this objection be reconsidered and withdrawn.

C. Obviousness-Type Double Patenting Rejection of Claims 1, 6, 7 and 9-12

In the outstanding Office action, claims 1, 6, 7 and 9-12 were rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-2 and 4-6 of the Lim et al. reference. Applicants respectfully traverse this rejection for at least the reasons set forth below.

Applicants have submitted herewith a terminal disclaimer, which disclaims the portion of any patent in the instant application extending beyond the term of the Lim et al. reference, which is commonly owned by the owner of the instant application. Therefore, applicants respectfully submit that the Lim et al. reference is not a proper reference, and respectfully request that this rejection be reconsidered and withdrawn.

D. Obviousness-Type Double Patenting Rejection of Claims 2-5 and 8

In the outstanding Office action, claims 2-5 and 8 were rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-2 and 4-6 of the Lim et al. reference in view of the Silverbrook and the Chan references.¹ Applicants respectfully traverse this rejection for at least the reasons set forth below.

Applicants have submitted herewith a terminal disclaimer, which disclaims the portion of any patent in the instant application extending beyond the term of the Lim et al. reference. Therefore, applicants respectfully submit that the Lim et al. reference is not a proper reference, and respectfully request that this rejection be reconsidered and withdrawn.

¹ Claim 3 was cancelled by the amendment filed December 19, 2006.

E. Obviousness-Type Double Patenting Rejection of Claim 4

In the outstanding Office action, claim 4 was rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-2 and 4-6 of the Lim et al. reference in view of the Chan reference. Applicants respectfully traverse this rejection for at least the reasons set forth below.

Applicants have submitted herewith a terminal disclaimer, which disclaims the portion of any patent in the instant application extending beyond the term of the Lim et al. reference. Therefore, applicants respectfully submit that the Lim et al. reference is not a proper reference, and respectfully request that this rejection be reconsidered and withdrawn.

F. Asserted Anticipation Rejection

In the outstanding Office action, claims 1, 2, 3, 5, 6 and 8 were rejected under 35 U.S.C. § 102(b) as being anticipated by the Silverbrook reference.² Applicants respectfully submit that the Silverbrook reference fails to disclose, or even suggest, each and every element of claim 1 for at least the reasons set forth below.

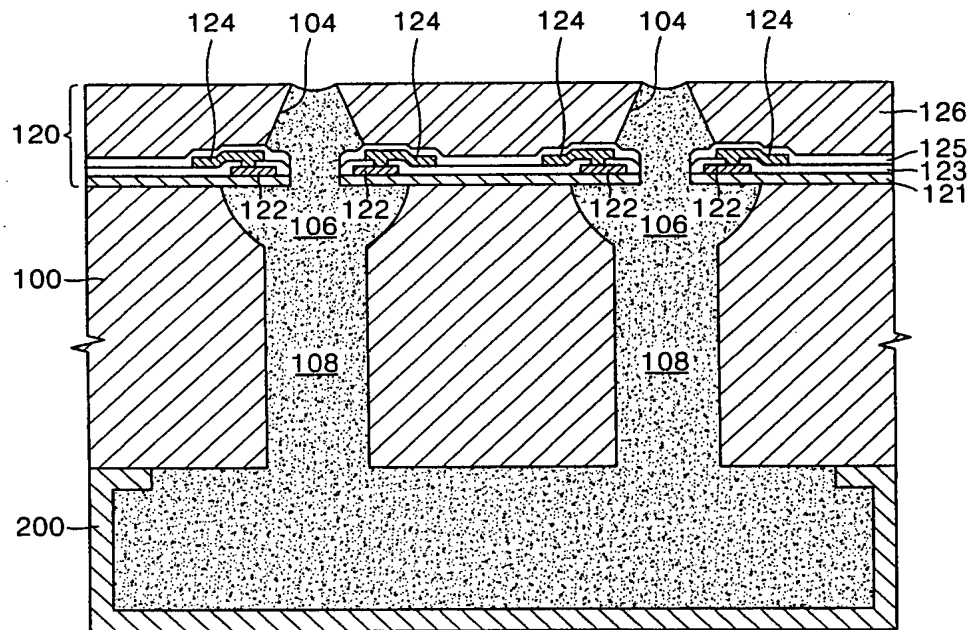
Claim 1 is amended by the instant amendment, and presently recites,

An ink-jet printhead, comprising:
a substrate;
an ink chamber to be filled with ink to be ejected formed on an upper surface of the substrate;
a restrictor defining a path through which ink is supplied from an ink reservoir to the ink chamber, the restrictor perforating a bottom surface of the substrate and a bottom surface of the ink chamber, and having a cross-sectional area that is less than that of the ink chamber and less than that of the ink reservoir;
a nozzle plate, which is stacked on the upper surface of the substrate and forms an upper wall of the ink chamber;
a nozzle perforating the nozzle plate at a position corresponding to a center of the ink chamber;
a heater formed in the nozzle plate to surround the nozzle; and
a conductor for applying a current to the heater.

² Claim 3 has been cancelled.

An ink jet printhead according to an exemplary embodiment is illustrated in drawing FIG. 6 of the instant application, which is reproduced below.

Drawing FIG. 6



As illustrated in drawing FIG. 6, a heater 122 disposed in a nozzle plate 120 generates heat to form a bubble in ink in an ink chamber 106. The bubble formed in the ink chamber 106 initially expands in a direction opposite to that of the nozzle plate 120, i.e., the bubble initially expands downward in drawing FIG. 6. The expanding bubble increases pressure in the ink chamber 106, causing ink to be expelled through a nozzle 104 in the nozzle plate 120. The ink jet printhead also includes a restrictor 108 that supplies ink directly to the ink chamber 106 from a reservoir 200, and which restricts reverse flow of ink from the ink chamber 106 toward the reservoir 200 during ink ejection.³

³ See the instant application at, e.g., paragraph [0051] (page 15, lines 1-10).

As illustrated in drawing FIG. 6, the restrictor 108 penetrates the lower surface of the substrate 100 so as to be in direct communication with the reservoir 200. This design significantly simplifies manufacture of the ink jet printhead using photolithographic techniques. It will be appreciated that photolithographic techniques are generally more accurate when a surface to be processed is planar and is in close proximity to the photolithographic equipment. Placing the ink reservoir 200 directly below the restrictor 108 provides a planar surface of the substrate 100, such that a region in which the restrictor 108 is to be formed is positioned at the outermost portion of the substrate 100. Thus, fabrication accuracy can be improved.⁴

As noted above, the restrictor 108 provides a restriction against the reverse flow of ink during operation of the ink jet printhead. It will be appreciated that, absent the restrictor 108, during ink ejection the expanding bubble would have a tendency to push a portion of the ink away from the nozzle plate 120, i.e., to displace the ink backward in the ink flow channel. Such a displacement is undesirable since, rather than ejecting ink from the nozzle 104, ink would be displaced in a direction opposite to the nozzle 104. Thus, by limiting reverse flow, the restrictor 108 significantly improves the efficiency of ink ejection.⁵

Applicants respectfully submit that the Silverbrook reference fails to disclose or suggest a restrictor, as recited in claim 1. In the outstanding Office action, a nozzle channel 114 that is described in the Silverbrook reference was equated to the restrictor recited in claim 1 of the instant application.⁶ However, applicants respectfully submit that the nozzle channel 114 fails to disclose, or even suggest, the restrictor recited in claim 1.

⁴ See the instant application at, e.g., paragraph [0018] (page 6, line 10 to page 7, line 25) and paragraph [0070] (page 19, line 17 to page 20, line 6).

⁵ See the instant application at, e.g., paragraph [0010] (page 3, lines 13-16) and paragraph [0070] (page 19, line 17 to page 20, line 6).

⁶ Office action mailed August 29, 2007, paragraph no. 3, page 6, and "Response to Arguments," at paragraph no. 8, page 10.

In particular, applicants respectfully submit that the Silverbrook reference fails to even suggest that the nozzle channel 114 acts as a restrictor, and fails to discuss flow resistance of the nozzle channel 114. Indeed, the Silverbrook reference fails to even suggest that reverse flow is a problem, or that reverse flow may be mitigated by a restrictor. Moreover, it is clear that the nozzle channel 114 cannot function as a restrictor, because it is significantly *larger* than the adjoining nozzle barrel 113 and, thus, would enhance, rather than restrict, the reverse flow of ink out of the nozzle barrel 113.⁷

Applicants note the Examiner's comments in the "Response to Arguments" of the outstanding Office action.⁸ Applicants respectfully submit that nothing in the "Response to Arguments" addresses applicants' arguments above regarding the failure of the applied art to disclose, or even suggest, a restrictor as recited in claim 1.

Additionally, to the extent that the Examiner may assert that the nozzle channel 114 of the Silverbrook reference would render obvious the restrictor recited in claim 1, applicants respectfully submit that nothing in the art of record teaches or suggests modifying the nozzle channel 114 to arrive at the restrictor recited in claim 1. Accordingly, applicants respectfully submit that the Silverbrook reference fails to disclose or suggest the restrictor recited in claim 1, and thus claim 1, as well as claims 2, 5, 6 and 8 depending therefrom, are allowable over the Silverbrook reference. Therefore, applicants respectfully request that this rejection be favorably reconsidered and withdrawn.

⁷ See the Silverbrook reference at col. 6, lines 11-19, which states that the nozzle channel 114 has an area of over 6 times that of the adjoining nozzle barrel 113 (a nozzle channel cross-sectional area of 7852 microns² as compared to a nozzle barrel cross-sectional area of 1256 microns², where nozzle channel dia. = 100 microns and nozzle barrel dia. = 40 microns; flow is proportional to the cross-sectional area of the feature, i.e., πr^2 , for a circular feature, where r is the radius of the feature). See also drawing FIGS. 9 and 17, which clearly show that the nozzle channel 114 is significantly larger than the adjoining nozzle barrel 113.

⁸ Office action mailed August 29, 2007, paragraph no. 8, page 10.

G. Asserted Obviousness Rejection of Claim 4

In the outstanding Office action, claim 4 was rejected under 35 U.S.C. § 103(a) as being unpatentable over the Silverbrook reference in view of the Chan reference. Applicants respectfully traverse this rejection for at least the reasons set forth below.

Claim 4 depends from claim 1. Applicants respectfully submit that the Chan reference fails to provide the teachings noted above as missing from the Silverbrook reference. Therefore, claim 4 is allowable over the Silverbrook and Chan references for at least the reasons set forth above regarding claim 1. Therefore, applicants respectfully request that this rejection be favorably reconsidered and withdrawn.

H. Asserted Obviousness Rejection of Claim 7

In the outstanding, Office action, claim 7 was rejected under 35 U.S.C. § 103(a) as being unpatentable over the Silverbrook reference in view of the Lee et al. reference. Applicants respectfully traverse this rejection for at least the reasons set forth below.

Claim 7 depends from claim 1. Applicants respectfully submit that the Lee et al. reference fails to provide the teachings noted above as missing from the Silverbrook reference. Therefore, claim 7 is allowable over the Silverbrook and Lee et al. references for at least the reasons set forth above regarding claim 1. Therefore, applicants respectfully request that this rejection be favorably reconsidered and withdrawn.

I. New Claims

By the instant amendment, claims 19 and 20 are added to depend from claim 1. No new matter is added, and support for claims 19 and 20 can be found in the application as originally filed at, e.g., paragraphs [0041], [0068] and [0070], and in drawing FIGS. 6, 16 and 17. Applicants respectfully request entry and examination of claims 19 and 20.

J. Conclusion

The above remarks demonstrate the failings of the outstanding rejections, and are sufficient to overcome them. However, while these remarks may refer to particular claim elements, they are not intended to, nor need they, comprehensively address each and every reason for the patentability of the claimed subject matter over the applied art. Accordingly, applicants respectfully submit that the claims are allowable for reasons including, but not limited to, those set forth above, and patentability of the claims does not depend solely on the particular claim elements discussed above.

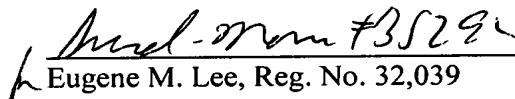
In view of the foregoing remarks, reconsideration of this application is earnestly solicited, and an early and favorable further action upon all the claims is hereby requested.

If the Examiner believes that additional discussions or information might advance the prosecution of the instant application, the Examiner is invited to contact the undersigned at the telephone number listed below to expedite resolution of any outstanding issues.

Respectfully submitted,

LEE & MORSE, P.C.

Date: November 29, 2007


Eugene M. Lee, Reg. No. 32,039

Attachment: Terminal Disclaimer

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PETITION and
DEPOSIT ACCOUNT CHARGE AUTHORIZATION

This document and any concurrently filed papers are believed to be timely. Should any extension of the term be required, applicant hereby petitions the Director for such extension and requests that any applicable petition fee be charged to Deposit Account No. 50-1645.

If fee payment is enclosed, this amount is believed to be correct. However, the Director is hereby authorized to charge any deficiency or credit any overpayment to Deposit Account No. 50-1645.

Any additional fee(s) necessary to effect the proper and timely filing of the accompanying-papers may also be charged to Deposit Account No. 50-1645.